Claims

What is claimed is:

1. A steam chest molded article molded from an expandable plastic material comprising a molded feature out of die draw.

2. The steam chest molded article as defined in claim 1 wherein the molded feature is at least one of a recessed and a protruded feature.

3. The steam chest molded article as defined in claim 2 wherein the molded feature has one of a plurality of angles outside the line of die draw.

4. The steam chest molded article as defined in claim 1 wherein the expandable plastic material is one of a styrene polymer, an acrylonitrile butadiene styrene (ABS) polymer, and a polyolefin.

5. The steam chest molded article as defined in claim 1 for use as an energy absorber in automotive vehicles.

6. A steam chest mold apparatus for forming molded a article having at least one out of die draw feature comprising:

a first mold portion and a complementary second mold portion for defining a mold cavity therebetween, said first mold portion including a fill plate having an inlet for introducing an expandable plastic material into the mold cavity; and

a cavity pull system comprising an actuator, a gear mechanism and a pin, the actuator extending through the fill plate to the gear mechanism and the pin extending from the gear mechanism into the mold cavity, said gear mechanism for translating a movement from the actuator to the pin, and wherein the pin is for forming the at least one out of die draw feature.

7. The steam chest mold apparatus as defined in claim 6 wherein the gear mechanism includes a pinion and a rack pin, said rack pin for being driven into the mold cavity.

8. The steam chest mold apparatus as defined in claim 7 wherein the rack pin is guided by a bushing.

9. The steam chest mold apparatus as defined in claim 6 wherein the cavity pull system is made from a temperature resistant and humidity resistant material.

10. The steam chest mold apparatus as defined in claim 9 wherein the temperature resistant and humidity resistant material is a stainless steel.

11. The steam chest mold apparatus as defined in claim 6 wherein the gear mechanism is made from brass.

12. The steam chest mold apparatus as defined in claim 7 wherein the pin is for engaging into the mold cavity at a plurality of angles so as to provide a molded feature at a plurality of angles out of die draw.

13. The steam chest mold apparatus as defined in claim 6 wherein the pin is moveable between a first position substantially outside the mold cavity and a second position substantially inside the mold cavity.

14. An energy absorbing element for absorbing an impact in a vehicle, said energy absorbing element made from expandable polypropylene in a steam chest mold, the energy absorbing element comprising an out of die draw feature.

15. The energy absorbing element as defined in claim 14 wherein the out of die draw feature has one of a plurality of angles out of the die draw.

16. A process for making a steam chest molded product including a molded feature that is outside the line of die draw comprising the following steps:

providing a first mold portion;

providing a second mold portion, said second mold portion being complementary to the first mold portion;

closing the first and the second mold portion with respect to one another for forming the mold cavity therebetween;

engaging a cavity pull system for molding a feature that is outside the line of die draw;

filling the mold cavity with an expandable plastic material;

introducing steam into the mold cavity for expanding and bonding the expandable plastic material to form the molded product;

disengaging the cavity pull system;

opening the mold; and

de-molding the molded product.

17. The process as defined in step 16 wherein the step of engaging the cavity pull system comprises the steps of actuating a cylinder for driving a gear mechanism and wherein said gear mechanism is for driving a pin into the mold cavity.

18. The process as defined in claim 17 wherein the pin is driven into the mold cavity at one of a plurality of angles for providing a molded feature at one of a plurality of angles outside the line of die draw.

19. The process as defined in claim 18 wherein the molded feature is one of recessed and protruded features.

20. The process as defined in claim 16 wherein the expandable plastic material is one of a styrene polymer, an acrylonitrile butadiene styrene (ABS) polymer, and a polyolefin.

21. The process as defined in claim 20 wherein the expandable plastic material is polypropylene.

22. An energy absorbing element including a molded feature that is outside the line of die draw made by the process as defined in claim 16.